A FIELD-BASED METHOD FOR DISTINGUISHING *MELOMYS BURTONI* FROM *M. CERVINIPES* (RODENTIA: MURIDAE) IN QUEENSLAND

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Melomys burtoni and *M. cervinipes* are broadly sympatric in eastern Australia but difficult to distinguish on external criteria. Although *M. cervinipes* attains a larger size than *M. burtoni*, the two species show significant overlap in standard external measurements and reliable identification currently requires examination of a cleaned skull. The hind foot plantar pads of 20 adult individuals of each of *M. burtoni* and *M. cervinipes* were examined and found to be a consistently larger in *M. cervinipes*. ❐ *Melomys, identification, burtoni, cervinipes, foot pads.*

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The current taxonomy of Australian *Melomys* recognises a total of four species, two of which (*M. burtoni* (Ramsay) and *M. cervinipes* (Gould)) have extensive, overlapping geographic ranges in northeastern Australia (Watts & Aslin, 1981). Although *M. cervinipes* attains a larger size than *M. burtoni* (Watts & Aslin, 1981) and has a relatively shorter tail (tail length more-or-less equal to the combined length of the head and body vs tail significantly longer than the head plus body in *M. burtoni* (Watts & Aslin, 1981)), the two species show significant overlap in standard external measurements. Pelage colour is individually and regionally variable in both species (Tate, 1951) and although habitat provides a useful clue to species identification (Watts & Aslin, 1981), both species are known to occur outside their preferred habitats (closed forest for *M. cervinipes*, grassland for *M. burtoni*) (Queensland Museum records). Thus, at present, reliable morphological identification requires vouchering and examination of a cleaned skull (Keith, 1970; Knox, 1978). A method to identify the two species on external criteria would be of great use for field survey of small mammals in northeastern Australia.

Cooper (1993; 1994) described the usefulness of plantar pads on the hind foot (pes) in distinguishing sympatric and morphologically similar species of rodents in Western Australia. A key produced more recently by Metzler & Clancy (1995) described the "longitudinal" pad of the pes as curved in *M. cervinipes* and straight in *M. burtoni*. I encountered difficulties using this feature to identify Queensland *Melomys* and investigated the utility of other aspects of hind foot morphology.

MATERIALS AND METHODS

As a starting point I examined all adult spirit specimens of *M. burtoni* and *M. cervinipes* with cleaned skulls in the collection of the Queensland Museum (QM). Adult status was determined on reproductive criteria (teats obvious on females, scrotal sac prominent on males). The species identity of all specimens was validated using the diagnostic feature of the first upper molar root pattern, as described by Knox (1978). Additional spirit specimens were then selected from the QM collection to increase the sample size within the documented body size range overlap between *M. burtoni* and *M. cervinipes*, and secondarily, to ensure good coverage of the area of geographic overlap. Skulls from these specimens were removed and cleaned to confirm their identity. The final sample included 20 specimens of each species (see Table 1).

Measurements were made of pes length (from heel to base of claw on central digit), combined head plus body length (anus to tip of nose), and the length of each of the six primary plantar pads. Small accessory plantar pads are variably discrete or fused to the first and fourth interdigital pads in both *Melomys* species (Fig. 1). Measurements of these pads were designed to avoid this secondary source of variation. Measurements were taken with Mitutoyo electronic calipers and rounded to an accuracy of 0.1mm.

The length of each pad was plotted against pes length to identify the measurement giving

TABLE 1. Location of specimen, sex, hind foot length, first interdigital pad length and head-body length of *Melomys cervinipes* and *M. burtoni* used in this study. Measurements in mm.

Species	QM registration number	Sex	Location	Pes length	First interdigital pad length	Head body length
Melomys cervinipes	JM9323	M	Ayr, Barratta Ck, 3km upstream of Bruce Hwy	25.0	2.4	91
	JM11570		Cowley Bch Training area, 1.75km NNE Main Camp	25.2	2.4	101
	SEW1444			25.5	2.8	96
	JM224	F	Innisfail Common	25.4	2.7	96
	JM1383	F	Cape Hillsborough	27.3	2.7	115
	JM10991	F	Mt Inkerman	26.2	2.6	110
	JM1151	F	Crediton	24.8	2.7	93
	JM14423		Bayview Heights, Meringa	26.0	2.7	109
	JM1329	M	Caloundra	27.4	2.8	113
	JM6724		Nitchaga Bridge, 3.5km W Koombooloomba	25.3	2.9	108
	JM10593	F	Hinchinbrook Is	25.5	3.4	110
	JM1147	F	Crediton	25.2	2.7	97
	JM5274	F	Shipton's Flat	26.7	3.0	111
	JM8337		Kirrama Ra SF	26.1	2.7	101
	JM14436	M	Noosa Heads NP (western side)	27.5	3.1	126
	JM11174	M	Nambour Bypass	26.5	2.8	122
	JM5337	F	Hinchinbrook Is,Gayundah Ck	28.3	2.7	98
	JM5341	F	Hinchinbrook Is, Scraggy Pt	27.4	2.8	105
	JM1143	F	Crediton	26.7	2.9	114
	JM14361		Awoonga Dam, from Boyne Valley to Miriam Vale	25.3	3.3	97
M. burtoni	J20173	M	Mackay	25.4	1.9	112
	JM13957	M	Buthen Buthen, Nesbit Rd, McIlwraith Ra	23.6	1.8	105
	JM13559		Yabulu	24.0	1.8	111
	JM10500		Rutland Plains Hold, 11.5km NW Rankin's Well	25.9	1.2	110
	J20181		Mackay	23.9	2.0	114
	J17785	M	Mt Molloy, 3km N	24.1	1.9	94
	JM3823	F	Eurimbulah NP	25.4	1.8	97
	J20110		Mackay	24.4	1.7	100
	JM11390	M	Jenners Rd, nr Sarina	25.3	1.6	110
	JM2615	M	Kauri Ck, inlet	25.3	1.7	100
	JM3821	F	Eurimbulah NP	25.2	1.8	99
	JM12570	M	Saunders Bch, nr Townsville (Nth)	24.9	1.9	107
	J20179	M	Mackay	26.0	2.0	112
	JM1382	M	Cape Hillsborough	24.8	1.5	104
	J21856	F	Nth Stradbroke Is	25.8	2.2	97
	JM3820	M	Eurimbulah NP	27.9	1.9	123
	JM14560		Princess Hills House Dam	26.5	2.`	104
	JM14563		Princess Hill House Dam	27.4	1.9	110
	JM4267		Pine R Bay, 23km WNW Weipa, Rocky Pt	24.9	2.3	112
	J20101	F	Mackay	23.8	1.9	97

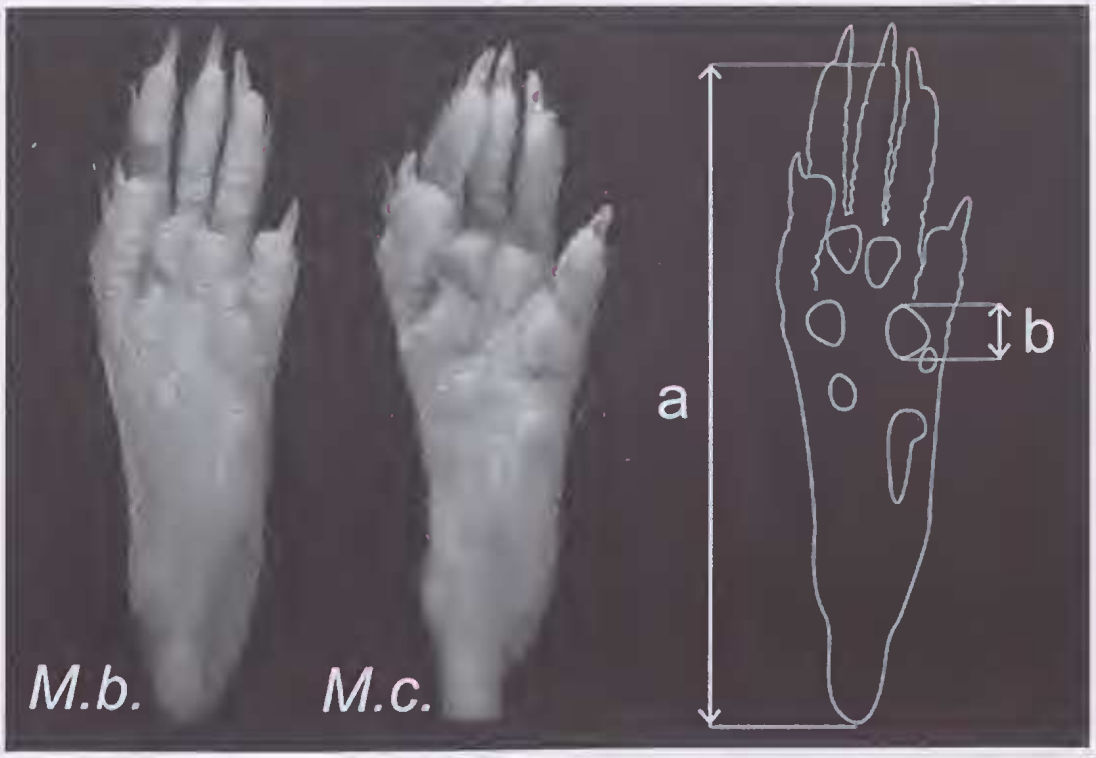

FIG. 1. Pes of A, *Melomys burtoni* and B, *M. cervinpipes* showing the relatively larger size of all plantar pads in *M. cervinipes* (plantar pads outlined in both). C, Outline of pes of *M. cervinipes* showing method of measuring total pes length (a) and the length of the first interdigital pad (b). Measurements of the first interdigital pad should be taken on the inner side of the pad to avoid the variation in the small aeeessory plantar pads whieh may be either diserete or fused. Speeimens figured are from the CSIRO ANWC wildlife eollection: A, *M. burtoni* adult male (CM16369) from Shoalwater Bay; B, *M. cervinipes* adult female (CM16349) from Shoalwater Bay, Speeies identifications based on upper molar root number, after Knox (1978).

the best diserimination. This proved to be the length of the first interdigital pad (terminology follows Brown & Yalden, 1973). The method of measurement for pes length and first interdigital pad length is indieated in Fig. 1.

RESULTS

The pes of *M. cervinipes* averages slightly longer than that in *M. burtoni* (mean ± s.d.: 26.17 ± 1.02 vs 25.22 ± 1.16; raw data in Table 1) and it also appears slightly broader for its length (Fig. 1). However, the two speeies show almost eomplete overlap in measurement ranges for pes length (24.8-28.3 vs 23.6-27.9) and any difference in width would be very diffieult to quantify.

In eontrast, foot pad size provides a reliable means of distinguishing the two speeies. As is obvious in side-by-side eomparison (Fig. 1), all of the plantar pads of *M. cervinipes* are relatively larger than those of *M. burtoni*. Measurements confirmed this visual impression, and further

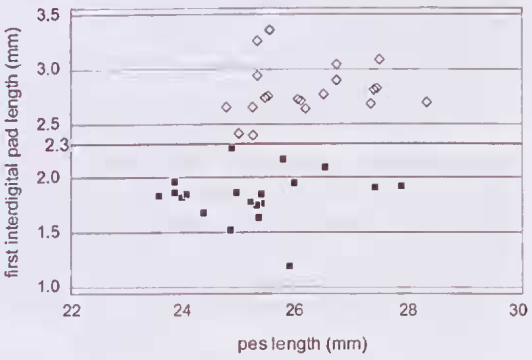

FIG. 2. Hind foot length versus first interdigital pad length in adult *M. burtoni* (solid squares) and *M. cervinipes* (open diamonds).

demonstrated that length of the first interdigital pad gave the most complete separation between the two species when plotted against pes length (Fig. 2). Importantly, length of this pad is not significantly correlated with pes length in either species, hence the single measurement appears to have diagnostic value across the full range of adult body size of both species. The cut off point appears to lie at 2.3mm—in all specimens of *M. burtoni* the first interdigital pad was shorter than 2.3mm, whilst in *M. cervinipes* this pad was consistently longer than 2.3mm.

DISCUSSION

This study has demonstrated a consistent difference in foot pad morphology between adults of *M. cervinipes* and *M. burtoni* across their area of geographic overlap, with *M. cervinipes* having measurably larger plantar pads than *M. burtoni*. Large plantar pads in murine rodents are commonly associated with scansorial or arboreal habits and the difference in pad size is consistent with the known ecological contrast between the more arboreal *M. cervinipes* and the more terrestrial *M. burtoni* (Watts & Aslin, 1981). Further studies could now extend this work to other species pairs within *Melomys*, such as *M. capensis* and *M. burtoni* that co-occur regionally on Cape York Peninsula

Although the present method appears to represent an advance over previous criteria for field identification of Australian *Melomys*, for several reasons I urge caution in its application. First, the reference series are relatively small (20 specimens per species) and did not sample the entire region of geographic overlap, e.g. sympatric populations in northern NSW were not included. Accordingly, it is likely that with more exhaustive sampling of museum specimens, some overlap in first interdigital pad length will be detected. Second, the utility of the measurement has not been tested for sub-adult and juvenile animals. Murid rodents as a group undergo significant changes in body proportions during growth from juveniles to adults, and caution must always be exercised in applying any diagnostic criterion beyond the limits of the original dataset. In the present case, it is likely that the inter-specific difference in plantar pad size develops during growth and that younger animals will show a less clear distinction.

For these reasons, I recommend that length of the first interdigital pad be added to the list of features currently used to identify eastern Australian *Melomys* (i.e. overall body size, relative tail length) and that particular care be taken to assess the individual age of a captured specimen.

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